ICRAR & ICRAR-Pawsey Summer Studentships 2018-2019
Project Proposal

Project Details	
Project Title	**Hunting for cosmic rays with the MWA**
Primary Supervisor	**Dr. Clancy W. James**
Primary Supervisor Availability	**Available for entire duration (Nov 2018 - Feb 2019) except the Christmas break (Dec 24th-Jan 4th)**
Contact Details	clancy.james@curtin.edu.au 08 9266 9473
Additional Supervisors & Contact Details	Mr. Brian Crosse (brian.crosse@curtin.edu.au), Dr. Justin Bray (justin.bray@manchester.ac.uk)
Additional Resources Required	None
Pawsey Centre Hardware Use	GPU cluster
Software Required	List all software requirements here. Student Desktop Requirements: • None Pawsey Centre software installations required: • CORSIKA (installed)
Student Location for project	ICRAR-Curtin
Project Description	Cosmic rays are the highest-energy particles in nature. Mostly protons, they reach energies more than a million times higher than that achieved at the Large Hadron Collider at CERN. Produced by something in the universe, when a cosmic ray hits the top of the atmosphere, it generates a huge 'extensive air shower' (EAS) of secondary particles, some of which reach ground level. This gives off a burst of radio-waves lasting less than a microsecond, allowing radio telescopes operating at the highest time resolution to study these rare particles. The Murchison Widefield Array in outback Western Australia aims to detect these bursts of radio-wave radiation. Particle detectors are being developed at the University of Manchester, UK, in order to identify EAS and trigger radio observations. A prototype detector will be deployed in late 2018 – this project will involve analysing the first data from this detector, and optimising the layout of a planned array of eight such detectors to be constructed during 2019. This will be aided by the simulation program CORSIKA, and pave the way for a future project with the Square Kilometre Array.
Student Attributes	
Academic Background	Students interested in both radio astronomy and particle physics, although no explicit background is necessary.
Computing Skills	None – the project will utilise Python, but this will be learnt during the program.
Training Requirement	HPC and parallel processing will be useful to the student, but not mandatory (usecase is modification of existing scripts).
Project Timeline	

Week 1	**Pawsey training (or inductions and project introduction)**
Week 2	Introduction to cosmic ray physics
Week 3	Familiarisation with particle detector data
Week 4	Calibration of particle detector: single muons
Week 5	Calibration of particle detector: results
Week 6	Introduction to CORSIKA
Week 7	Running CORSIKA: particles at ground level
Week 8	Optimisation of array: triggering on simulated data
Week 9	Collation of results and report writing
Week 10	**Final Presentation and Reporting**